How Trends like Digital Twins and IoT Impact Construction?

The construction industry is one of the biggest sectors of the world economy. Its ecosystem comprises of stakeholders such as the designers, architects, engineers, and construction workers. On any given project having multiple stakeholders, the complexities stem from various functions and stages of the project. Typical challenges faced by AECO projects are - rising construction costs, material procurement delays, budget and time overruns, workforce shortage, health and safety of the workforce, and construction site issues. The volatility of the AEC industry is inevitable. However, the sector can immensely enhance its productivity and efficiency with the help of digital tools and rewiring certain processes on the backbone of technology. Digital transformation is the right step towards achieving faster and more sustainable construction within the estimated time and budget. Digital tools such as Digital Twins paired with IoT can help construction companies get closer to this goal.

What is Digital Twin and IoT?

Digital Twin is the real-time representation of a physical asset. The multi-dimensional, visual representation of any asset helps the team foresee the effect of design changes, weather conditions, or on-site security challenges.

The Internet of Things (IoT) connects machines or devices that can be mechanically or electronically managed from remote locations. The Digital Twin is created by collating physical data of the asset and its components with the help of IoT devices such as sensors, 3D laser scanners, drones, etc. The IoT support enables the Digital Twin model to scan and analyze data from multiple sources, predict the asset behavior, and make simultaneous adjustments in tandem with the real-world asset.

The AEC industry is aware of the powerful impact the Building Information Model (BIM) has on any construction. Pairing [BIM](#) with Digital Twin and IoT can offer a powerful grade to the project implementation through agile construction processes and cost savings while offering asset longevity and insights into every asset component.

Let's find out how.

Optimum resource planning

Timely allocation of resources like labour and materials, planning of specific milestones, mitigating on-site conflicts are key to the success of any construction project. Any bottlenecks in the supply chain such as delays in material procurement or shortage of labor can impact productivity and cause huge losses to the project. Besides, the construction and demolition debris are estimated to be around one-quarter of the national waste in the USA. BIM helps address these challenges and enables optimum resource utilization. The data from Digital Twin and IoT devices used in conjunction with the [BIM modeling](#) can help estimate the exact material

and labor required for a project. This, in turn, allows project owners to order materials in requisite quantities in tune with the project timelines. Efficiency of the project improves, and wastage, losses and risks are minimized significantly.

Quality and compliance check

Quality assurance (QA) and compliance can be accomplished by integrating the 3D BIM model with real-time data of the physical world from the IoT and Digital Twin. For example, the concrete quality can be assessed from the photo or video captured through image-processing algorithms. Similarly, IoT sensors can also help identify cracks on columns or intrusions in structures. This foresight can alert contractors to manually inspect the construction and do the damage control. Thus, the Digital Twin and IoT along with the BIM model can ensure high-standard asset quality and compliance.

Improved human force safety

The construction industry is one of the world's largest workforce employers, but construction sites throw perils at the workforce which need to be addressed by project managers. Safety risks are of utmost concern for the workforce. [Digital Twins to Support Public Health & Safety](). Labor-intensive, high-risk tasks are performed in the open air and in many cases on high rises. Digital Twins paired with IoT sensors on the building can alert site managers when the construction team is working on a hazardous site or handling dangerous/ toxic materials. Ensuring high safety standards should be a priority for the AEC industry worldwide and visibility to every element and stage of construction can equip project managers to enforce safety through appropriate personal, protective equipment and other on-site measures.

Efficient project planning

The data from IoT sensors is not only helpful during the construction of a building but is also an information goldmine for the construction of similar assets. The IoT devices with the Digital Twin model can record the impact of temperature, humidity, wind, and pressure on the building and model each layer of the building based on these environmental factors. The data monitored and analyzed for this building can be used to predict the feasibility of other projects subject to similar environmental conditions. These insights help in sustainable project planning, predictable project implementation and ensures asset longevity.

Investments in digital tools such as BIM, Digital Twin, and IoT can yield good dividends both in the short and long term. The right approach coupled with these technologies can empower the sector to build sustainable assets, ensure optimum resource utilization and guarantee safe and healthy working conditions for the construction workforce.

Conserves energy and save cost

Real time data of [HVAC Systems]() can be access by asset managers any time and anywhere, the building spaces can be analyzed and monitor which may require energy consumption. In current

working model this works best where entries of the employees are allowed on working days which are fixed. This kind of practices not only optimize the unitization of energy carbon emission as well as saves the asset maintenance costs.

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